WHAT IS CLAIMED IS:

1. An apparatus for decoding in a receiver physical layer header information symbols, which have been encoded with a coding rate of $(2^k, 2k+1)$ and transmitted through a frame having physical layer header information, in an ultra wide band (UWB) communication system in which a plurality of devices have the receiver constitute a piconet and data transmission between the plurality of devices is performed through the frame, said apparatus comprising:

a mask sequence generator for generating $(2^k - 1)$ mask sequences, each having an inherent mask sequence index;

a plurality of AND elements for receiving the mask sequences and an encoded physical layer header information symbol sequence of length 2^k as inputs, performing AND operations respectively between the mask sequences and the encoded physical layer header information symbol sequence, and outputting physical layer header information symbol sequences from which the mask sequences are removed;

a plurality of correlation calculators for receiving the encoded physical layer header information symbol sequence and the physical layer header information symbol sequences from which the mask sequences are removed, calculating correlation values respectively between a corresponding one of the symbol sequences and a plurality of bi-orthogonal Walsh codes, each code having an inherent Walsh code index, and outputting a largest one of the calculated correlation values, a corresponding mask sequence index, and a Walsh code index corresponding to the largest correlation value; and

a correlation comparator for comparing the correlation values output respectively from the plurality of correlation calculators, combining together a Walsh code index and a mask sequence index, both corresponding to a largest

one of the compared correlation values, and outputting the combined indices as (2k+1)-bit physical layer header information.

2. The apparatus according to claim 1, wherein the physical layer header information is information of a MAC frame's transfer rate, data length, and a scrambling code used in the transmitter.

3. The apparatus according to claim 1, wherein the value of k is 5.

4. A method for decoding in a receiver physical layer header information symbols, which have been encoded with a coding rate of $(2^k, 2k+1)$ and transmitted through a frame having physical layer header information, in an ultra wide band (UWB) communication system in which a plurality of devices have the receiver constitute a piconet and data transmission between the plurality of devices is performed through the frame, said method comprising the steps of:

a) generating $(2^k - 1)$ mask sequences, each having an inherent mask sequence index;

b) receiving, as inputs, the mask sequences and an encoded physical layer header information symbol sequence of length 2^k;

c) performing AND operations respectively between the mask sequences and the encoded physical layer header information symbol sequence;

d) outputting physical layer header information symbol sequences from which the mask sequences are removed;

e) receiving, as inputs, the encoded physical layer header information symbol sequence and the physical layer header information symbol sequences from which the mask sequences are removed;

f) calculating correlation values respectively between each of the symbol sequences and a plurality of bi-orthogonal Walsh codes, each code having an inherent Walsh code index;

g) outputting, for each of the symbol sequences, a largest one of the calculated correlation values, a corresponding mask sequence index, and a Walsh code index corresponding to the largest correlation value; and

h) comparing the output correlation values corresponding respectively to the symbol sequences; combining together a Walsh code index and a mask sequence index, both corresponding to a largest one of the compared correlation values; and

i) outputting the combined indices as (2k+1)-bit physical layer header information.

5. The method according to claim 4, wherein the physical layer header information is information of a MAC frame's transfer rate, data length, and a scrambling code used in the transmitter.

6. The method according to claim 4, wherein the value of k is 5.

7. A frame structure for transmitting data in an ultra wide band (UWB) communication system, said frame structure comprising: at least one section of physical layer header information that is encoded with an error-correcting code.

8. The frame structure according to claim 7, wherein the error-correcting code is a 2nd-order Reed Muller code.

9. An apparatus for protecting and transmitting by a transmitter physical layer header information of respective header information of layers, in an ultra wide band (UWB) communication system in which a plurality of devices have the transmitter constitute a piconet and data transmission between the plurality of devices is performed through a frame having said respective header information of the layers, said apparatus comprising:

a bi-orthogonal sequence generator for generating a bi-orthogonal sequence by performing an AND operation between more significant bits of physical layer header information bits and predetermined basis Walsh code sequences;

a mask sequence generator for generating a mask sequence by performing an AND operation between less significant bits of the physical layer header information bits and predetermined mask sequences; and

an exclusive OR element for performing an exclusive OR operation on a symbol-by-symbol basis between the bi-orthogonal sequence output from the bi-orthogonal sequence generator and the mask sequence output from the mask sequence generator, so as to output a single encoded symbol sequence.

10. The apparatus according to claim 9, wherein the physical layer header information bits are 11 bits in length.

11. The apparatus according to claim 10, wherein the physical layer header information bits include information of a MAC frame's transfer rate and information of a payload length.

12. The apparatus according to claim 9, wherein the bi-orthogonal sequence generator comprises:

a bit "1" generator for generating a sequence of 1s;

a basis Walsh code generator for generating 5 basis Walsh code sequences of length 32; and

a plurality of AND elements for receiving all 11 bits of the physical layer header information as their inputs, performing respective AND operations between 5 more significant bits of the 11 bits and the 5 basis Walsh code sequences, and performing an AND operation between a sixth bit of the 11 bits and the sequence of 1s.

13. The apparatus according to claim 9, wherein the mask sequence generator comprises:

a basis mask sequence generator for generating 5 basis mask sequences of length 32; and

a plurality of AND elements for receiving all 11 bits of the physical layer header information as their inputs, and performing respective AND operations between 5 less significant bits of the 11 bits and the 5 basis mask sequences.

14. A method for protecting and transmitting by a transmitter physical layer header information, of respective header information of layers, in an ultra wide band (UWB) communication system in which a plurality of devices have the transmitter constitute a piconet and data transmission between the plurality of devices is performed through a frame having said respective header information of the layers, said method comprising the steps of:

a) generating a bi-orthogonal sequence by performing an AND operation between more significant bits of physical layer header information bits and predetermined basis Walsh code sequences;

b) generating a mask sequence by performing an AND operation between less significant bits of the physical layer header information bits and predetermined mask sequences;

c) performing an exclusive OR operation on a symbol-by-symbol basis between the generated bi-orthogonal sequence and the generated mask sequence, and

d) outputting a single encoded symbol sequence.

15. The method according to claim 14, wherein the physical layer header information bits are 11 bits in length.

16. The method according to claim 15, wherein the physical layer header information bits include information of a MAC frame's transfer rate and information of a payload length.

17. The method according to claim 14, wherein said step a) comprises the steps of:

a-1) generating a sequence of 1s;

a-2) generating 5 basis Walsh code sequences of length 32;

a-3) receiving, as inputs, all 11 bits of the physical layer header information;

a-4) performing respective AND operations between 5 more significant bits of the 11 bits and the 5 basis Walsh code sequences; and

a-5) performing an AND operation between a sixth bit of the 11 bits and the sequence of 1s.

18. The method according to claim 14, wherein said step b) comprises the steps of:

b-1) generating 5 basis mask sequences of length 32;

b-2) receiving, as inputs, all 11 bits of the physical layer header information; and

b-3) performing respective AND operations between 5 less significant bits of the 11 bits and the 5 basis mask sequences.